TWIN-SIMILARITIES IN PERSONALITY TRAITS*[1]

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It is desirable that quantitative studies be made in order to give more exact and scientific information on the popularly accepted view of similarity of twins in personality traits. The importance of extending studies of twin-similarities to traits other than intelligence is obvious, but the movement has been held in check by the slow development of measuring instruments. It seems likely that such study will not only contribute much-needed information concerning twins, and the nature-nurture question, but will also further the aims of those interested in the measurement of personality traits. Knowledge of twin-similarities, bearing as it does upon the origin and development of the traits investigated, should contribute much to our understanding of the traits, and hence facilitate the construction of suitable instruments for measurement.

In dealing with personality trait constellations, there is likelihood that some facts will be discovered which do not parallel exactly those which are found for intelligence measures. For example, the writer has made the clinical observation that unlike-sex twins are in some ways more similar than fraternal like-sex twins, and it is likely that quantitative studies in this field will provide more accurate descriptions of that fact. Perhaps personality traits are more affected by training and experience; if so, statistical studies will undoubtedly show results of interest for comparison with facts already established by use of intelligence tests.

THE DATA

The Bernreuter Personality Inventory was administered to a group of 133 pairs of twins, or a total of 266 subjects. This group included both like- and unlike-sex pairs, and among the subjects were

15 pairs of mature individuals, varying in age from 20 to 65 years. The others represent a random selection from the junior- and senior-high-school populations of San Jose, Palo Alto, and San Francisco. Separate treatment has been given the results for these disparate groups. The subjects were classified into monozygotic and dizygotic groups, using the techniques described by Bonnevie (3), Dahlberg (4), Siemens (8), Newman (7), Muller (6), and others, and now quite generally accepted.

The Bernreuter Personality Inventory affords measures of four traits. Table 1 presents some information concerning these traits,

TABLE 1

RELIABILITY COEFFICIENTS* AND INTERCORRELATIONS FOR THE TRAITS MEASURED
BY THE BERNREUTER PERSONALITY INVENTORY
(Data obtained on 128 Stanford students.)

	B1-N	B2-S	B3-I	B4-D
B1-N (neurotic tendencies)	.88	—.39	.93	—.82
B2-S (self-sufficiency)		.85	—.28	.50
B3-I (introversion)			.85	—.73
B4-D (dominance)				.88

*The reliability coefficients were obtained by the split-half technique, and corrected by the Spearman-Brown formula.

obtained from the manual (1). For further information concerning the development and use of the test, the reader should consult the work of Bernreuter (2). As evidence for the validity of the measures, the manual presents the correlations with other measures which had already been developed for the separate traits. These coefficients are very high.

The use of this test offers special advantages, in that it is easily administered, subjects enjoy taking it, and a minimum amount of time on the part of the subjects is required. These features, and the elimination of objectionable items, favor more adequate cooperation on the part of the subjects, which is quite essential because the data are based on self-estimates. In this study very good cooperation was secured; no coercion was used, and none was necessary. Testing was done individually, and in small groups, and was preceded by a few preliminary explanations designed to promote cooperation. Antagonistic responses were not aroused; the subjects took the tests willingly and with an eagerness to find out the results, which were subsequently reported to them.

The blanks were scored for all four measures, although it is recog-

nized that B1-N and B3-I are rather highly correlated.   Means and standard deviations of raw scores were computed for males and females separately, and standard scores computed.   Thus sex differences were eliminated, making it possible to deal with the combined groups in computing coefficients of resemblance.   As the distributions of scores seemed to be approximately normal, this procedure was preferred rather than use of the percentile scores to eliminate sex differences.

INFLUENCES OF AGE AND INTELLIGENCE

Although it happens that the group is relatively homogeneous with respect to age, in view of the fact that age changes in some traits are very rapid at this stage of development, it was considered desirable to study the possible influence of this factor on the scores obtained.   Table 2 shows the age correlations.

TABLE 2

SHOWING THE CORRELATIONS OF AGE WITH SIGMA SCORES ON THE FOUR SCALES OF THE BERNREUTER PERSONALITY INVENTORY, FOR A GROUP OF 231 JUNIOR- AND SENIOR-HIGH-SCHOOL STUDENTS*

The ages of the subjects ranged from 12 to 19 years inclusive, with a mean of 16.1 years and a standard deviation of 1.48 years.

	N	r	P.E.
CA and B1-N	231	.00	.044
CA and B2-S	231	.09	.044
CA and B3-I	231	.04	.044
CA and B4-D	231	.15	.043

*In the group were 107 girls and 124 boys.   Since sigma scores were obtained separately for boys and girls, sex differences in means and standard deviations have been eliminated before combining the groups.

Consideration of the actual distributions suggests that the correlations in Table 2 are not low primarily because of the curtailment of range, but rather because there is in fact a very low correlation of these functions with age.   Scores in a vocabulary or arithmetic test would have shown a much higher correlation over the same age range. The main fact to which attention is called is that the coefficients are sufficiently small to show that the contribution of age to individual differences in the traits here dealt with is negligible for this group of subjects.   Partialling out age would not appreciably lower the coefficients of resemblance reported later in this paper.   Care has been taken to accord separate treatment to the small group of older subjects, in order that any age factor possibly operative over a wider range cannot influence the results.

For a considerable number of the subjects, measurements of intelligence were available in the school records.   Table 3 presents the correlations of these intelligence scores with the traits of personality.

TABLE 3

SHOWING THE CORRELATIONS OF TERMAN GROUP TEST IQ'S WITH SIGMA SCORES
ON THE FOUR SCALES OF THE PERSONALITY INVENTORY, FOR A GROUP
OF 148 JUNIOR- AND SENIOR-HIGH-SCHOOL STUDENTS*

	N	r	P.E.
IQ and B1-N	148	.04	.055
IQ and B2-S	148	.10	.054
IQ and B3-I	148	.05	.055
IQ and B4-D	148	—.01	.055

*This group for which intelligence measures were available included 81 boys and 67 girls.   This sample is, so far as is known, fairly representative of the total group.   The IQ's ranged from 73 to 140, with a mean of 102.7 and a standard deviation of 13.8 points.   The ages ranged from 12 to 19 inclusive, with a mean of 15.9 and a standard deviation of 1.57 years.   The correlation between IQ and age was —.19 for this group of 148 cases.

For measurement of the relationship between these variables and intelligence, the present data are imperfect, but still of considerable value.   They show, for a relatively unselected group of school subjects, that almost no correlation is to be expected between these variables and IQ.   The absence of significant correlation means that the coefficients of resemblance reported later are not due to dependence of the traits in question upon general intelligence.

MEASUREMENTS OF RESEMBLANCE

Separate treatment has been given to a group of 15 pairs of mature identical twins.   Table 4 shows the results obtained for the various groups of identical twins only.   The results of Table 4 suggest that the degree of similarity found for identical twins is very much the

TABLE 4

SHOWING THE CORRELATIONS OF SCORES ON THE FOUR SCALES OF THE PERSON-
ALITY INVENTORY, FOR THE SUBGROUPS OF IDENTICAL TWINS,
AND FOR THE COMBINED GROUPS*

	Correlation coefficients			
	B1-N	B2-S	B3-I	B4-D
School group, 40 pairs	.61	.59	.43	.75
Mature group, 15 pairs	.69	.13	.57	.67
Combined group, 55 pairs	.63	.44	.50	.71

*The single noteworthy discrepancy in the values for the separate groups is in the trait B2-S, where the correlation for mature identical twins is unduly low.   Omitting one pair, the coefficient for the remaining group of 14 mature pairs becomes .49 and the correlation for the combined group becomes .53.   Hence the discrepancy seems to be caused largely by the grossly different scores of a single pair.

same for the youthful group and for the older group, and no serious error would result from use of the coefficients obtained on the combined group as the most representative figures for the resemblance of monozygotic twins.   However, to make the figures strictly comparable, the correlations obtained on the school group alone are used

TABLE 5

SHOWING THE CORRELATIONS OF SCORES ON THE FOUR SCALES OF THE PERSON-
ALITY INVENTORY, FOR MONOZYGOTIC TWINS, FRATERNAL LIKE-SEX
TWINS, AND UNLIKE-SEX TWINS

These are comparable groups of junior- and senior-high-school students.

	No. of pairs	Raw r	P.E.	Corrected coefficients*		
				4	5	6
BI-N (neurotic tendencies)						
Identical twins	40	.61	.07	.55	.69	.62
Fraternal like-sex twins	43	.32	.09	.32	.36	.36
Unlike-sex twins, double-entry	35	.18	.11	.30	.20	.34
Unlike-sex twins, single-entry	35	.19	.11		.22	
B2-S (self-sufficiency)						
Identical twins	40	.59	.07	.58	.69	.68
Fraternal like-sex twins	43	—.14	.10	—.24	—.16	—.28
Unlike-sex twins, double-entry	35	.12	.11	.08	.14	.09
Unlike-sex twins, single-entry	35	.13	.11		.15	
B3-I (introversion)						
Identical twins	40	.43	.09	.40	.50	.47
Fraternal like-sex twins	43	.40	.09	.42	.47	.49
Unlike-sex twins, double-entry	35	.18	.11	.27	.21	.32
Unlike-sex twins, single-entry	35	.18	.11		.21	
B4-D (dominance)						
Identical twins	40	.75	.05	.76	.85	.86
Fraternal like-sex twins	43	.34	.09	.33	.39	.38
Unlike-sex twins, double-entry	35	.18	.11	.22	.20	.25
Unlike-sex twins, single-entry	35	.19	.11		.22	

*Column 4 gives the correlations corrected for range only, Column 5 gives the coefficients corrected for attenuation only, and Column 6 presents the results of correction for both range and attenuation. The correction for range was done in order to make these several groups more comparable. The ranges for the separate groups were corrected to equal that for the total group.   For discussion of these statistical procedures, see Kelley (5).

All correlations were calculated by a double-entry system, but those for unlike-sex pairs were checked by use of the single-entry system also, with the male's score on one axis and the female's score on the other.   The agreement is, of course, very good.

in Table 5, for comparison with the results obtained for fraternal twins.   The results in Table 5 show that the identical twins are in

general most similar, unlike-sex twins least similar (except in self-sufficiency), and fraternal like-sex twins intermediate. The exceptions are, however, very important. In neurotic tendencies, identical twins are significantly more similar than the fraternal like-sex or unlike-sex groups. In introversion it appears that like-sex pairs are considerably more similar than unlike-sex pairs, but the monozygotic twins are not significantly more similar than the dizygotic like-sex pairs. In dominance, the greater similarity of identical twins is more marked than in any of the other traits.

Perhaps the most interesting peculiar finding is that for self-sufficiency. There the like-sex fraternal twins are dissimilar, although not significantly so. The obtained correlation is negative—a finding which is very rare in studies of family resemblances. The scatter-diagrams for these correlations are presented as Tables 6, 7, and 8. It is the aim of the writer to collect additional data, to increase the size of the groups and reduce the probable errors of the correlations, as a further attack upon the problem.

TABLE 6

SCATTER-DIAGRAM SHOWING THE CORRELATION OF SCORES ON THE SELF-SUFFICIENCY SCALE, FOR 43 PAIRS OF FRATERNAL LIKE-SEX TWINS
A double-entry system was used in the plotting. The plotted points represent the sigma scores of the twins on the self-sufficiency scale. The number in each cell is the number of plotted points which fell in that cell. The correlation coefficient is —.14 and its probable error is .10.

	23-25.9	26-	29-	32-	35-	38-	41-	44-	47-	50-	53-	56-	59-	62-	65-	68-	71-	74-76.9
74-76.9																		
71-							1											
68-																1		
65-				1		1	1	1	1									
62-		1					1		1						1			
59-		1						1										
56-				1		3	1	1	2		2							
53-				1		2		1	1	2								
50-						1	3			1	2	1	1	1				
47-				1	3	1	1				1	1		1				
44-				1		1	4	1	3		1		1	1				
41-					1		1	1	1	2	3			1		1		
38-						1		3										
35-							1	1		1	1				1			
32-		1																
29-			1										1	1				
26-																		
23-25.9																		

TABLE 7

SCATTER-DIAGRAM SHOWING THE CORRELATION OF SCORES ON THE SELF-SUFFICIENCY SCALE, FOR 40 PAIRS OF IDENTICAL TWINS

A double-entry system was used in the plotting. The plotted points represent the sigma scores of the twins on the self-sufficiency scale. The number in each cell is the number of plotted points which fell in that cell. The correlation coefficient is .59 and its probable error is .07.

	23-25.9	26-	29-	32-	35-	38-	41-	44-	47-	50-	53-	56-	59-	62-	65-	68-	71-	74-	77-79.9
77-79.9																			
74-															1				
71-														1					
68-											2					1			
65-										1									
62-											2	1							1
59-												1	1						
56-							1			1		2	2	1			1		
53-					1	1				2	1		2	1	1			2	
50-			1							1	2	1			2	1			
47-				2			2			1	2	1							
44-			2			1	4	2											
41-				1	3			1				1	1						
38-				1	2	3						1							
35-	1				1	1			2										
32-								2											
29-					1							1							
26-																			
23-25.9																			

While speculation at this point may be premature, it may nevertheless be pointed out that the results concerning self-sufficiency are quantitative data in support of the writer's point of view gained from intensive study and close personal observation of twins. He has observed that because of attitudes toward each other the fraternal like-sex twins are often less closely associated in some respects than the unlike-sex pairs. The interests of like-sex fraternal twins are considerably different. A condition of rivalry exists between them, and in many instances there is an absence of that attitude of comradeship which is present to a considerable degree among unlike-sex pairs, and to a very marked degree among identical twins. Perhaps self-sufficiency in one tends to cause dependence (i.e., a lack of self-sufficiency) on the part of the other.

TABLE 8

SCATTER-DIAGRAM SHOWING THE CORRELATION OF SCORES ON THE SELF-SUFFICIENCY SCALE, FOR 35 PAIRS OF UNLIKE-SEX TWINS

A double-entry system was used in the plotting. The plotted points represent the sigma scores of the twins on the self-sufficiency scale. The number in each cell is the number of plotted points which fell in that cell. The correlation coefficient is .12 and its probable error is .11.

	23-25.9	26-	29-	32-	35-	38-	41-	44-	47-	50-	53-	56-	59-	62-	65-	68-	71-	74-	77-	80-82.9
80-82.9										1										
77-																				
74-																				
71-							1			1										
68-																				
65-				1						1										
62-						1	1		1	1	1	1								
59-													2							
56-											1			1	1		1			1
53-		1				1	1			1		1		1						
50-						1	1	2		1				1						
47-	1	1		2			2	3	2	2				1		1				
44-				1	1	1		3	1											
41-							2	1	2	1	1			1						
38-							1				1			1						
35-							1	2												
32-															1					
29-							1			1										
26-							1													
23-25.9																				

SUMMARY, CONCLUSIONS, AND SUGGESTIONS

The Bernreuter Personality Inventory was applied to 133 pairs of twins, classified as to type. The four traits measured by the test have been shown to be practically independent of age influences and of intelligence as measured by the Terman Group Test. The greater similarity of monozygotic twins is evident to a marked degree in the measures of dominance, neurotic tendencies, and self-sufficiency, but not in introversion. Like-sex pairs were definitely more similar than unlike-sex pairs in introversion, and to a lesser extent in neurotic tendencies and in dominance. An extremely interesting new problem has been indicated by the finding of a negative correlation between like-sex fraternal twins in self-sufficiency. Although this particular finding is not demonstrated to be significant, it is sufficiently important to merit further investigation. The measurements of the personality trait constellations were made by use of a standard test, with scales of known reliability and validity.

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LES RESSEMBLANCES DE TRAITS DE PERSONNALITÉ CHEZ LES
JUMEAUX

(Résumé)

Cent trente-trois paires de jumeaux, dont 55 monozygotes, 43 fraternels
de même sexe, et 35 paires non de même sexe, ont subi l'Inventaire de
Personnalité de Bernreuter.   Entre les membres des paires de jumeaux
identiques, les corrélations brutes sont de 0,61 pour les Tendances névro-
siques, de 0,59 pour la Suffisance, de 0,43 pour l'Introversion et de 0,75 pour
la Dominance.   Pour les jumeaux fraternels de même sexe les coefficients
correspondants sont de 0,32, de —0,14, de 0,40, et de 0,34 respectivement.
Pour les jumeaux non de même sexe ils sont de 0,18, de 0,12, de 0,18, et
de 0,18 respectivement.   L'âge et l'intelligence n'influent pas sur ces corré-
lations.
    La plus grande ressemblance des jumeaux monozygotes se montre à un
degré marqué dans les mesures de la Dominance, des Tendances névrosiques,
et de la Suffisance, mais ne se montre pas dans celle de l'Introversion.
Les paires de jumeaux dizygotes de même sexe sont définiment plus sem-
blables que les paires non de même sexe dans l'Introversion, et d'une façon
moins marquée dans les Tendances névrosiques et la Dominance.   Dans
la Suffisance, c'est le contraire.   Un nouveau problème intéressant s'est
montré quand l'on a trouvé une corrélation négative entre les jumeaux
fraternels de même sexe dans la Suffisance.
    La correction des corrélations pour l'atténuation, et la comparaison des
résultats pour les jumeaux monozygotes et les jumeaux dizygotes mon-
trent que pour ces traits de personnalité les coefficients de ressemblance

sont moins élevés que ceux ordinairement rapportés pour les mesures de l'intelligence et du rendement. On croit que ceci est caractéristique des traits qui sont influencés plus facilement par les influences du milieu.

CARTER

ÄNLICHKEITEN IN BEZUG AUF PERSÖNLICHKEITS-EIGENSCHAFTEN BEI ZWILLINGEN

(Referat)

Das Bernreuter'sche Persönlichkeitsinventarium [Bernreuter Personality Inventory] wurde auf 133 Zwillingspaare angewendet, einschliesslich 55 monozygotische (eineiige) Zwillingspaare, 43 geschwisterliche Zwillingspaare (nicht eineiige) des selben Geschlechtes [like-sex fraternal], und 35 Zwillingspaare ungleichen Geschlechtes. In Bezug auf Mitglieder identischer Zwillingspaare betrugen die Rohkorrelationen bezüglich der Neigungen zur Nervösität [neurotic tendencies] .61, bezüglich des Selbstvertrauens .59, bezüglich der Introversion .43, und bezüglich des Dominierens [dominance] .75. Die entsprechenden, an geschwisterlichen Zwillingen gleichen Geschlechtes ermittelten Korrelationskoeffizienten betrugen respektiv .18, .12, .18, und .18. Diese Korrelationszahlen werden durch Alter und Intelligenz nicht beeinflusst.

Die stärkere Ähnlichkeit der monozygotischen Zwillinge zeigt sich in hohem Grade in den Messungen des Dominierens der Neigungen zur Nervösität, und des Selbstvertrauens, nicht aber in Bezug auf die Introversion. Gleichgeschlechtliche zweieiige [dizygotic] Zwillingspaare weisen eine bedeutend stärkere Ähnlichkeit auf, als Paare ungleichen Geschlechtes, in Bezug auf Introversion und, in geringerem Grade, in Bezug auf Neigungen zur Nervösität und auf das Dominieren. In Bezug auf Selbstvertrauen ist das Verhältnis das entgegengesetzte. Durch die Entdeckung einer negativen Korrelation zwischen geschwisterlichen Zwillingen gleichen Geschlechtes in Bezug auf das Dominieren wird auf eine interessante neue Aufgabe hingewiesen.

Unter Berücksichtigung der vermindernden Einwirkungen auf die Korrelationszahlen [correcting the correlations for attenuation] wurden die an monozygotischen mit den an zweieiigen Zwillingen erhaltenen Befunden verglichen. Man fand, dass diese, an Eigenschaften der Persönlichkeit ermittelten Ähnlichkeitskoeffizienten [coefficients of resemblance] niedriger sind, als die gewöhnlich für Messungen der Intelligenz und der Leistungsfähigkeit [achievement] gemeldeten. Der Verfasser ist der Meinung, dass dieser Befund für Eigenschaften, die durch äussere Einwirkungen leichter beeinflusst werden, typisch ist.

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